Alberta
HUMAN RESOURCES AND EMPLOYMENT

the people & workplace department

September 2001

Occupational Injuries and Diseases in Alberta

Drilling of Oil and Gas Wells 1996 to 2000

Upstream Oil and Gas Sub-Sector #4

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1. Introduction

The Mission of Alberta Human Resources and Employment

Alberta Human Resources and Employment's mission is to foster safe and healthy workplaces. Workplace Health and Safety works within the continuum of services provided by Alberta Human Resources and Employment. Its focus is on the development and implementation of strategies and initiatives aimed at meeting the department's goal that Alberta will have a fair, safe and healthy work environment. To this end, Alberta Human Resources and Employment recognizes that monitoring workplace health and safety will help to ensure that primary concerns are actively managed and that resources are directed where needed.

This report summarises the lost-time injuries and disease descriptions, characteristics of the injured worker and the risk of injury to workers in Alberta's upstream oil and gas industries for the years 1996 to 2000. Cost of the injuries and revenue in terms of total premiums paid by employers are presented as well. Finally, a summary of occupational fatalities accepted by the WCB for compensation and brief descriptions of fatalities investigated by Workplace Health and Safety are also provided.

The purpose of this report is to provide government, employers, workers and health and safety officers in upstream oil and gas industries with information about the industry key health and safety issues.

Description of Upstream Oil and Gas Industries

The upstream oil and gas industries can be subdivided into the following sub-sectors.
Exploration, Oilfield Maintenance and Construction, Well Servicing with Service Rigs and Power Swivels, Drilling of Oil and Gas Wells, Oilfield Downhole and Other Services, Tar Sands, Petroleum Producers, and Oilfield Trucking Services.

The next section gives the descriptions of the Drilling of Oil and Gas Well sub-sector.

2. Sub-Sector Description

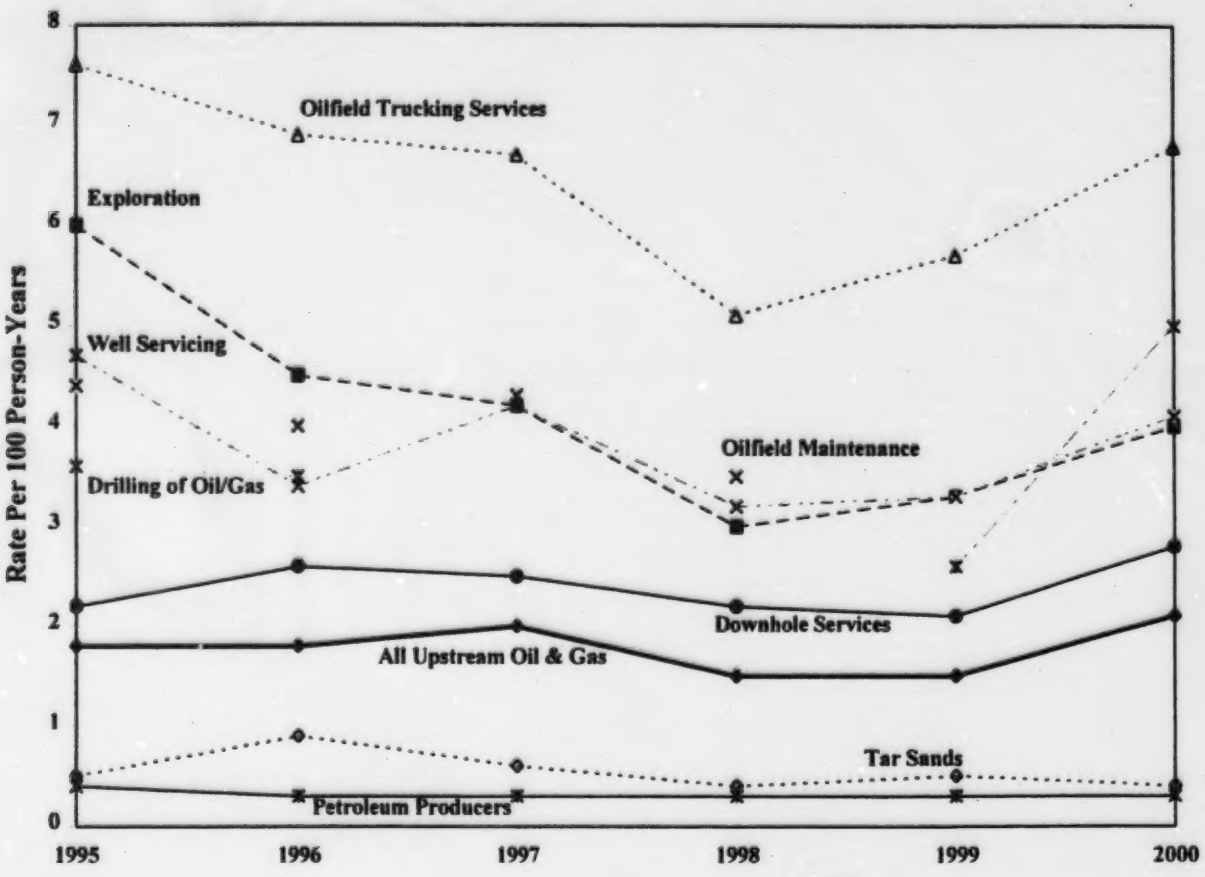
Sub-Sector # 4: Drilling of oil and gas wells

Drilling of oil and gas well (Industry # 9600)
Oil well drilling is performed by independent drilling companies contracted directly to oil companies. Oil companies will coordinate the drilling program and may provide on site direction and supervision, but do not become physically involved in operating the drilling rig.

Small crew, including a rig manager (tool push), driller, derrick hand, motor hand, floorhands (roughneck) and lease hands carry out the drilling of gas and oil wells. Drilling can be round-the-clock operations using shift workers
The drilling of gas and oil wells involves the use of large heavy-duty rigs or derricks that may be capable of drilling several thousand feet into the earth. The equipment is set up at a predetermined location and drilling commences for two to four weeks. Considerable time is spent setting up the equipment; however, this is considered part of the drilling operations. Also included is the activity of leveling the drilling rig. This involves the use of heavy hydraulic jacks (50 to 100 tons) to raise or lower the oil derrick prior to drilling. Heavy timbers are used to stabilize where necessary. Due to tremendous torque or twisting pressure exerted by the drill stem, it is necessary that the rig be level.

Blowout control and well fire fighting are also in this industry. The procedure necessary to cap a wildcat well varies. Sometimes a blowout can be brought under control by pumping mud or cement to stop the flow, or replacing valves on the blowout preventer. If a well catches fire, the fire must be extinguished before the well can be capped. A common method is to use explosives to cut off the fire's oxygen supply. Employers that are hired to set explosives for this purpose are covered in this industry.

Lost-Time Claim Rates
Upstream Oil & Gas Subsectors
Alberta: 1995-2000



3. Lost-Time Claim Rates and Duration Rates

09600-Drilling of Oil and Gas Wells

Year	# of Accounts	Cost	Person Years	Days Lost	Duration Rate	LTCs	LTC Rate
1996	66	$1,986,527	5,700	10,747	189	197	3.5
1997	79	$2,661,066	6,871	13,995	204	289	4.2
1998	81	$2,221,502	6,077	11,475	189	182	3.0
1999	83	$1,336,103	5,137	7,899	154	133	2.6
2000	88	$3,206,349	5,707	17,454	306	287	5.0

3.1 LTC Rates by Size of Employer: 2000

Size of Employer	# of Accounts	LTCs	Person - Years	LTC Rate
A: 0<= PYs < 1	37	2	11	N/A
B: 1<= PY < 5	6	4	16	N/A
C: 5 <= PYs < 10	5	4	32	N/A
D: 10 <= PYs < 20	6	15	92	16.3
E: 20 <= PYs < 40	10	33	317	10.4
F: 40 <= PYs < 100	12	46	807	5.7
G: PYs >=100	10	181	4,432	4.1
H: Invalid	2	2	N/A	N/A
Total	88	287	5,707	5.0

4. Analysis of the Lost-Time Claims

4.1 Nature of Injury

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
FRACTURE/DISLOCATION	57	91	54	41	87	330	30.3
SPRAIN, STRAIN, TEARS	34	71	40	23	72	240	22.1
OTHER TRAUMATIC INJURY/DISEASE	28	33	22	18	30	131	12.0
SURFACE WOUNDS, BRUISES	19	33	18	18	30	118	10.8
OPEN WOUNDS	22	20	21	13	26	102	9.4
SYSTEMATIC DISEASES, DISORDERS	16	21	10	4	22	73	6.7
BURNS	10	8	11	2	12	43	4.0
NATURE - UNS	8	9	5	8	7	37	3.4
MULTIPLE DISEASE/DISORDERS	1	1	.	6	.	8	0.7
SYMPTOMS, SIGN/ILLNESS	1	.	1	.	1	3	0.3
OTHER DISEASE/DISORDERS	1	2	.	.	.	3	0.3
Total	197	289	182	133	287	1,088	100.0

4.2 Type of Event/Exposure

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
UNKNOWN	31	22	8	7	28	96	8.8
STRUCK BY OBJECTS	48	68	33	42	76	267	24.5
CAUGHT IN OBJECTS	28	48	44	23	48	191	17.6
OVEREXERTION	16	34	29	15	30	124	11.4
FALL TO LOWER LEVEL	20	39	18	11	18	106	9.7
FALL ON SAME LEVEL	12	23	12	15	13	75	6.9
EXPOSURE TO HARMFUL SUBSTANCES	16	11	16	4	17	64	5.9
BODILY REACTION	9	14	7	4	22	56	5.1
STRUCK AGAINST OBJECTS	6	8	5	1	6	26	2.4
OTHER FALLS	1	7	.	4	9	23	2.1
TRANSPORTATION ACCIDENTS	2	5	2	5	8	22	2.0
REPETITIVE MOTIONS	5	6	4	1	4	20	1.8
OTHER BODILY REACTION/EXERTION	1	2	.	.	3	6	0.6
RUBBED OR ABRADED	2	.	.	1	2	5	0.5
FIRES AND EXPLOSIONS	.	1	.	.	1	2	0.2
OTHER CONTACT WITH OBJECT/EQUIP.	.	.	1	.	1	2	0.2
ASSAULT/VIOLENT ACT BY PERSON	.	.	1	.	1	2	0.2
OTHER ASSAULTS/VIOLENT ACTIONS	.	1	.	.	.	1	0.1
Total	197	289	182	133	287	1,088	100.0

4.3 Part of Body Injured

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
BACK	36	50	32	19	44	181	16.6
FINGER(S)	32	34	34	23	36	159	14.6
OTHER TRUNK	23	37	19	15	45	139	12.8
LEG(S)	25	43	24	17	26	135	12.4
ANKLE(S) & FOOT(FEET)-NOT TOES	17	33	16	10	42	118	10.8
HAND(S)	18	24	12	5	19	78	7.2
OTHER HEAD	11	16	12	14	24	77	7.1
OTHER UPPER EXTREMITIES	10	26	13	12	9	70	6.4
MULTIPLE BODY PARTS	7	8	7	11	14	47	4.3
OTHER LOWER EXTREMITIES	11	5	6	4	10	36	3.3
EYE(S)-OPTIC NERVE,VISION	3	2	4	2	12	23	2.1
NECK	2	5	3	1	3	14	1.3
BODY SYSTEMS	2	4	.	.	2	8	0.7
UNKNOWN	.	2	.	.	1	3	0.3
Total	197	289	182	133	287	1,088	100.0

4.4 Source of Injury

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
UNKNOWN	62	75	44	29	61	271	24.9
PARTS & MATERIALS	42	59	40	30	66	237	21.8
STRUCTURES/SURFACES	20	51	27	14	33	145	13.3
MACHINERY	11	27	18	15	21	92	8.5
PERSONS-INJURED WORKER	16	22	11	5	27	81	7.4
HANDTOOLS-UNPOWERED	13	20	12	10	12	67	6.2
OTHER SOURCES	10	5	11	7	27	60	5.5
CONTAINERS	8	9	7	10	6	40	3.7
OTHER TOOLS/EQUIPMENT	3	6	4	7	8	28	2.6
VEHICLES	3	5	2	5	10	25	2.3
CHEMICAL/CHEMICAL PRODUCTS	6	5	3	.	8	22	2.0
FURNITURE & FIXTURES	1	2	.	1	3	7	0.6
PERSONS-NOT THE INJURED WORKER	1	.	1	.	3	5	0.5
HANDTOOLS-POWERED	.	1	1	.	1	3	0.3
MINERAL-METALS/NONMETALS	1	1	.	.	.	2	0.2
PLANTS & ANIMALS	.	1	1	.	.	2	0.2
OTHER PLANTS/ANIMALS/MINERALS	.	.	.	.	1	1	0.1
Total	197	289	182	133	287	1,088	100.0

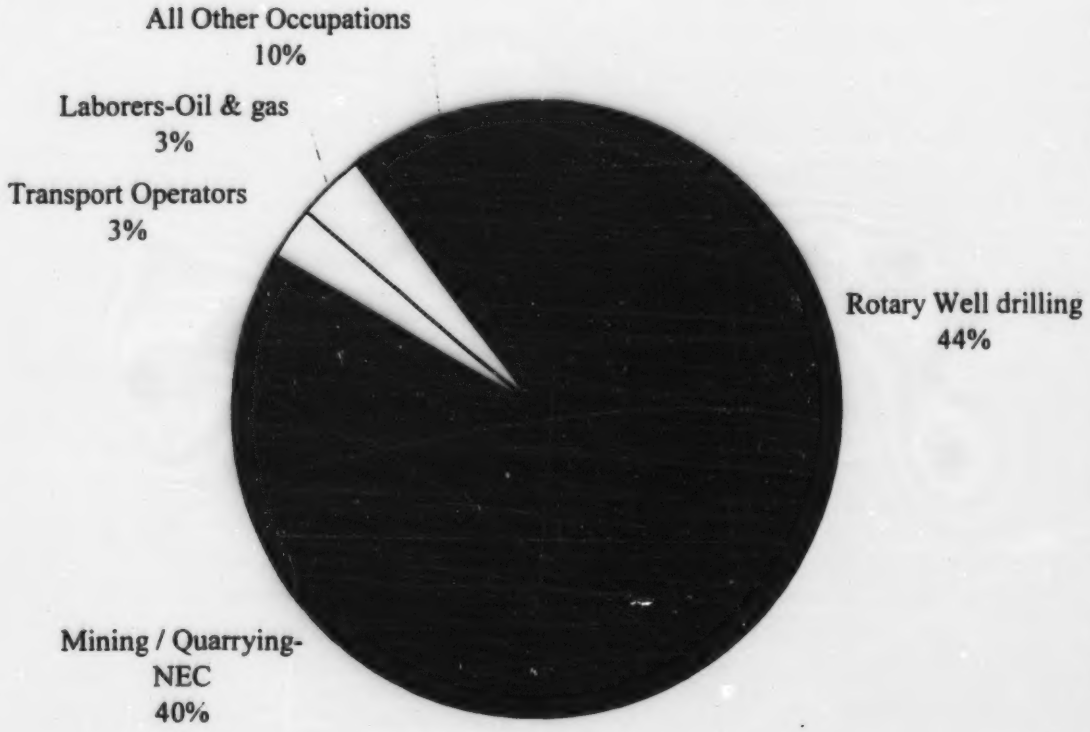
4.5 Duration of Disability

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
01 - 05 DAYS LOST	14	31	16	6	31	98	9.0
06 - 10 DAYS LOST	14	31	10	12	20	87	8.0
11 - 15 DAYS LOST	10	17	11	10	23	71	6.5
16 - 20 DAYS LOST	16	12	12	6	11	57	5.2
21 - 30 DAYS LOST	19	24	14	11	18	86	7.9
31 - 40 DAYS LOST	15	22	13	10	22	82	7.5
41 - 50 DAYS LOST	8	16	10	9	14	57	5.2
51 OR MORE DAYS LOST	80	92	69	59	107	407	37.4
DAYS LOST-UNSPECIFIED	21	44	27	10	41	143	13.1
Total	197	289	182	133	287	1,088	100.0

5. Characteristics of the Injured Worker

5.1 Occupation of the Injured Worker

Occupation of Injured Worker
1996-2000



5.2 Age of injured Worker

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
15-19 YEARS	10	19	9	5	11	54	5.0
20-24 YEARS	40	73	42	31	64	250	23.0
25-34 YEARS	93	118	76	52	123	462	42.5
35-44 YEARS	46	71	43	37	68	265	24.4
45-54 YEARS	4	5	7	6	16	38	3.5
55-64 YEARS	3	3	4	2	3	15	1.4
65 YRS AND OVER	.	.	1	.	1	2	0.2
AGE-UNSPECIFIED	1	.	.	.	1	2	0.2
Total	197	289	182	133	287	1,088	100.0

5.3 Length of Time Employed

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
A. LESS THAN 1 MONTH	41	68	27	24	64	224	20.6
B. 1 MONTH TO < 6 MONTHS	45	84	34	22	53	238	21.9
C. 6 MONTHS TO < 1 YEAR	22	21	20	6	24	93	8.5
D. 1 YEAR OR MORE	31	40	25	38	37	171	15.7
E. TIME-UNSPECIFIED	58	76	76	43	109	362	33.3
Total	197	289	182	133	287	1,088	100.0

5.4 Gender of Injured Worker

LOST-TIME CLAIMS ALBERTA: 1996 TO 2000	OCCURRENCE YEAR					Total	
	1996	1997	1998	1999	2000	Number	Percent
MALE	193	283	179	130	285	1,070	98.3
FEMALE	2	2	1	2	2	9	0.8
GENDER-UNSPECIFIED	2	4	2	1	.	9	0.8
Total	197	289	182	133	287	1,088	100.0

6. Cost of Claims and Employer Premiums

Sub-Sector 4- Drilling of Oil & Gas Wells

	Occurrence Year				
Transaction Year	**1996**	**1997**	**1998**	**1999**	**2000**
1996	$1,566,540				
1997	$1,536,088	$2,297,077			
1998	$939,346	$2,161,716	$1,815,786		
1999	$1,047,934	$2,988,285	$1,494,894	$1,376,298	
2000	$1,594,565	$1,495,960	$1,903,797	$1,783,367	$2,660,481
Total cost	$6,684,473	$8,943,038	$5,214,477	$3,159,665	$2,660,481
Total Premiums	$10,261,045	$13,643,945	$8,036,778	$5,534,828	$10,116,343

The above claim cost and employer premiums are for the five-year period 1996 through 2000. The data are as of May 4, 2001.

The cost of claim amount reflects only paid cost on claims that have occurred in the five-year period. The claim costs are tracked by occurrence year and the year that the costs were transacted.

The premiums are the total of all premiums paid by employers in each year.

7. Occupational Fatalities

An occupational fatality is the death of a worker that results from a work-related incident or exposure. Alberta Human Resources and Employment classifies occupational fatalities into three general types: motor vehicle incident, workplace incident and occupational diseases. Each is described in detail below.

Motor Vehicle Incident

Motor vehicle incidents typically involve highway vehicles operating on public roads in which the fatally injured worker was either the driver or a passenger. This category also includes fatalities involving aircraft crashes, train crashes, helicopter crashes, etc.

Workplace Incident

Fatal workplace incidents consist of cases in which the worker dies at a work site, or as a result of injuries sustained at a work site. It is this type of fatality that Alberta Human Resources and Employment may be responsible for investigating.

Occupational Diseases

Occupational disease fatalities consist mostly of recognized occupational disease, that is, disease known to be primarily or exclusively work-related (e.g. asbestosis, black lung disease). Occupational diseases are frequently diagnosed many years after the initial or crucial exposure to the toxic substance, and in such cases it is very difficult to determine when the fatal exposure occurred. Thus, the occupational disease category should not be interpreted to reflect present work site hazardous conditions or exposures.

Each year the Workers' Compensation Board (WCB) accepts some occupational fatality claims for compensation. Occupational fatality claims that were accepted in a particular year may include fatalities from prior years.

Description of Drilling of Oil/Gas Wells Workplace Fatalities Accepted by the WCB Alberta: 1996-2000

YEAR	Motor Vehicle Incidents		Workplace Incidents		Total	
	N	%	N	%	N	%
1996	0	0	2	100.0	2	100
1997	1	33.3	2	66.7	3	100
1998	1	100.0	0	0	1	100
1999	0	0	1	100.0	1	100
2000	0	0	3	100.0	3	100
Total	2	20.0	8	80.0	10	100

8. OHS Investigated Occupational Fatalities: 1996-2000

YEAR: 1996 FILE: 0845
OCCUPATION: Floor hand - Oil Well Drilling AGE: 25
INDUSTRY: Drilling Oil & Gas Wells
EXPERIENCE: Unspecified

DESCRIPTION: A crew was in the process of drilling a well. In the process of making a connection, adding a length of pipe to the drilling string, the hammer nut on the swivel caught a horizontal beam on the crown stand. This caused the bottom end of the pipe to whip toward the back of the rig floor. The floor hand was unable to move out of the way and was struck in the face and chest, and was thrown about 2.5 metres where his head contacted racked pipe. This resulted in fatal injuries to the floor hand.

YEAR: 1996 FILE: 0846
OCCUPATION: Floor hand - Oil Well Drilling AGE: 31
INDUSTRY: Drilling Oil & Gas Wells
EXPERIENCE: 287 hours, total rig experience, 72 hours as a floor hand

DESCRIPTION: A crew was preparing a rig for a move at the time of the incident, by removing and storing pipe from the well. While raising a length of pipe so it could be uncoupled, the break-out tong of the floor man caught on the pipe, rising along with it. The floor hand was caught by the safety cables and pinned against the structure of the rig, causing fatal injuries.

YEAR: 1997 FILE: 0862
OCCUPATION: Floor Hand AGE: 20
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: Less than one year

DESCRIPTION: The drilling crew was in the process of tripping out drill pipe, when they came to a set of cross over subs. These subs are used to adapt parts of the drilling string, which cannot otherwise be screwed together because of the difference in thread size or design. The crew attached the tongs to the collars and sub and applied torque to break open the joint between the two. The lead tong (tongs are the large wrenches that are latched onto drill pipe or drill collars in order to make up "tighten" or break out "loosen" joint or drill pipe or drill collars) latch lug jaw failed, broke off, and struck the worker in the head fatally injuring him.

YEAR: 1997 FILE: 0877
OCCUPATION: Floorhand AGE: 22
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: Unknown

DESCRIPTION: An oilrig crew was finishing the process of laying down an oilrig derrick on two bedtrucks, in preparation for the rig move. The worker assisted a gin pole truck operator in rigging the A-leg section of a mast so a spreader bar could be removed and the A-leg lowered. The A-leg was secured to a lifting lug, which was attached to a hook and winch line of a gin pole truck. The worker removed a pin that secured a spreader bar to the derrick and then climbed onto the derrick to remove the spreader bar. The worker polled the spreader bar off, lost his balance and fell forward under the suspended A-leg. Simultaneously, the lifting lug used in lowering and raising the A-legs failed. The A-leg fell on the worker, causing fatal injuries.

YEAR: 1999 FILE: 0918
OCCUPATION: Lease Hand AGE: 25
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: 39 months on rigs / 69 days on Rig #159SL

DESCRIPTION: The worker was resetting the pipe handling system at the drill rig. To facilitate the pipe transfer process, the transfer arm was to be repositioned to the next tier of drill pipes. A drill pipe, left from the previous transferred layer, was resting on the transfer arm. The worker lost control of the transfer arm when he attempted to reposition it. The drill pipe resting on the transfer arm rolled down and struck the worker on the head. The worker died from serious head injuries.

YEAR: 2000 FILE: 0968
OCCUPATION: Derrickhand AGE: 53
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: 20 Years

DESCRIPTION: The truck driver was in the process of moving a drilling rig to a lease site. He tried to place the equipment in its proper operating position.

The shack was loaded onto the flatbed. The truck driver tried to back the manifold shack from the flatbed into it's operating position with assistance from a designated swamper, but movement was restricted due to the smaller size of the lease. The driver decided to back his truck to the lease entrance but did not tell the swamper of his intentions. The truck driver started to back up without direction from the swamper. The driller and derrickhand were standing south of the drilling rig's substructure. The driller instructed the derrickhand to get the operator and the dozer to remove some soil by the mud tank. The derrickhand walked away towards the dozer. He was facing away from the truck that was backing up. The truck had an audible back-up alarm system, but the alarm was shut off.

The manifold shack that was hanging off the roll bar knocked the derrickhand down and the truck backed over him.

YEAR: 2000 FILE: 0976
OCCUPATION: Unknown AGE: 32
INDUSTRY: Drilling of Oil and Gas Wells
EXPERIENCE: Unknown

DESCRIPTION: A worker was killed when the travelling block on a drilling rig fell to the rig floor. During the drilling process, the drill collars twisted off down the hole. The drilling crew had been removing the pipe out of the hole to retrieve the drill collars when the travelling block contacted the crown, severing the hoisting line.

Appendix A: Terms, Definitions, and Formulas

Lost-Time Claim

A lost-time claim (LTC) is a claim for an occupational injury or disease, which disables the worker beyond the day of injury. Included are claims for which wages compensation are paid, permanent disability claims, fatalities, and cases in which the injured worker is assigned light duties or other modified work.

Person-Years

Person-year estimates are calculated from wage and payroll data provided by account holders to the WCB. Alberta Human Resources and Employment uses these data to estimate an average industry wage, and uses the average industry wage and employer payroll data to estimate person-years for each employer and each industry. One person-year is equivalent to one full-time worker working for one year, and can be assumed to equal 2,000 hours worked.

LTC Rate

The lost-time claim (LTC) rate is calculated by dividing the number of lost-time claims by the person-year estimate, and multiplying the result by 100. The LTC rate represents the probability or risk of disabling injury or disease to a worker during a period of one-year work. Comparisons of LTC rates between industries, or between years, can be used to indicate increases, decreases, or differences in this risk.

$$\text{LTC Rate} = \frac{\text{Number of LTCs X 100}}{\text{Estimated Person-years}}$$

Duration (Days Lost)

The duration of disability is the number of days following the injury or disease for which the worker was disabled, and unable to perform normal work duties. This information is obtained for this report from data on compensation days paid on each claim from WCB. Alberta Human Resources and Employment obtains these data on March 31 of the year following the claim year, and does not update the information, even though many injured workers continue to be disabled beyond this date. As a result, the duration information reported here underestimates the true impact of lost-time injury and disease.

Duration Rate

The duration rate is calculated by dividing the number of workdays lost (disability days) by the person-year estimate, and multiplying by 100. The result is expressed as days lost per 100 person-years worked, and indicates, in part, the economic impact of occupational injury and disease. Duration rates are not recommended as reliable indicators of full economic cost. In addition, readers are warned that duration rates are highly unstable when based on only a few lost-time claims; it is recommended that the duration rate not be calculated based upon fewer than 30 lost-time claims.

$$\text{Duration Rate} = \frac{\text{Disability Days X 100}}{\text{Estimated Person-Years}}$$

WCB Accepted Fatality

An occupational fatality is the death of a worker which resulted from a work-related incident or exposure and which has been accepted by the WCB for compensation. A fatality is counted in the year it is accepted.

NEC

Means 'Not Elsewhere Classified'.

UNS

Means 'Unspecified'.

Appendix B: Upstream Oil and Gas 2000 Industry Codes

Sub-Sector 1: **Exploration**
Industries: 09200~Seismic Geophysical/Mineral Exploration
09201~Shot Hole Drilling

Sub-Sector 2: **Oilfield Maintenance and Construction**
Industries: 06304~Oilfield Construction and/or Maintenance

Sub-Sector 3: **Well Servicing With Service Rigs**
Industries: 09903~Well servicing with Service Rigs including Power Swivels

Sub-Sector 4: **Drilling of Oil and gas Wells**
Industries: 09600~Drilling of Oil & Gas Wells

Sub-Sector 5: **Downhole & Other Oilfield Services**
Industries 06305~Field Production Operators
06306~Vacuum Removal of Waste
09900~Mud Logging
09902~Pressure Cleaning Services
09904~Rathole Drilling and Rig Anchoring
09911~Oilfield Downhole Services
09915~Well Casing Services
09921~Servicing Christmas Trees On Oil Wells
09927~Liquid Waste Treatment & Disposal

Sub-Sector 6: **Tar Sands**
Industries: 06600~Mining & Processing of Bituminous Sand
06601~Research/Development, Oil Sands and Heavy Oil Recovery

Sub-Sector 7: **Oil & Gas Exploration/Development**
Industries: 06300~Oil and Gas Exploration & Development-Upstream Operations

Sub-Sector 8: **Oilfield Trucking Services**
Industries: 50720~Oilfield Trucking Services

For further information contact:

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http://www.gov.ab.ca/hre

Alberta Workplace Health and Safety website:
http://www.whs.gov.ab.ca